

CHAPTER 13DLIQUID AND GAS STORAGE TANKS13D-01 GENERALa. Definition

This chapter covers material, equipment, and good workmanship practices for installation of liquid and gas storage tanks.

b. Approvals

(1) Review ENG Form 4268, Submittal Register, and insure that all material, equipment, and shop drawings are approved prior to preparatory inspections and prior to either fabrication or installation of foundation, tanks and associated equipment.

(2) Obtain any helpful manufacturer*s information.

c. Storage and Handling

(1) Insure that storage yard is placed in an area that will not require movement of stored materials for Installation of utility lines or other structures. Storage yard should be adequate in size and location for both storing, sorting, and retrieval of materials for erection.

(2) Insure that all materials are safely and properly stored to prevent damage.

(3) Reject damaged materiel and equipment. Have such items removed from the site.

(4) In handling heavy items use proper size construction equipment to lift the loads being handled. Use proper size slings, clamps, and chocking devices when lifting or moving materials.

(5) provide necessary storage yard drainage, dunnage, and working room for both equipment and personnel.

d. Coordination of Work

Continually check for interferences between structural, electrical, and mechanical features, especially utilities in the underground areas adjacent to the erection area.

13D-02 BULK STORAGE TANKSa. Above Ground Tanks

(1) Determine that fabrication is in accordance with API standards (for Petroleum Products).

(2) Verify compliance with approved shop drawings.

(3) Examine foundation details.

(4) Observe installation of sand base (oiled sand for Air Force projects)

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(5) Check thoroughly all welds for compliance with design and workmanship. Check specifications for required weld sampling. Reject welds not meeting these requirements. Check specifications for destruct and non-destruct testing requirements for welds.

(6) Examine certified mill reports for steel.

(7) Inspect interior of tank, sump, and pipes for cleanliness.

(8) Refer to Chapter 5B for welding.

(9) Determine orientation of tanks.

(10) Measure plate thickness.

(11) Insure nameplates or stamps on tanks.

(12) Witness testing of the bottom and top plate welds. Prior to testing, see that welded joint is well soaped.

(13) Insist that approved construction sequence is rigidly followed.

(14) Note tank foundation prior to assembly and welding of the bottom plates.

(15) Verify that tank foundation is not damaged during erection of tank.

(16) Assure that radiographic inspection is made and records substantiate the results.

(17) Inspect tank openings and fittings for location, size, type, and reinforcement.

(18) Make sure that rim seals provide firm and continuous contact between seal ring and tank shell at all times and under all conditions, from partial to full tank capacity, without binding or excessive wear.

(19) Insist that weatherhoods are provided over rim seals.

(20) Be certain that Zinc-coated or galvanized materials are not permitted where there is a possibility of their coming into contact with the fuels.

(21) Ensure that emergency venting requirements in API 650 are met.

(22) Electrical Grounding.

(a) Determine that electrical grounding has been installed.

(b) Require testing by an electrical inspector after grounding is complete.

(c) Check gasketed pipeline joint for electrical bonding of adjacent pipe.

(d) Check insulated pipe flanges to insure complete electrical separation.

(23) Insure that gage pipe column is plumb from top of tank to bottom.

(24) Float-operated liquid level guage should be checked for easy and accurate operation from an empty to a full tank. Cable and tape should be installed level and plumb to avoid friction or binding in protective pipe, pulleys, and guage-well cover ferrule.

(25) Tanks should be calibrated and a certified guage table prepared, as specified. Witness the calibration operations. In the industry, calibration and strapping are synonymous.

(26) Stairways, platforms, ladders, and safety guages should be examined for compliance with approved design and for conformance to safety regulations.

(27) Provide adequate ventilation and lighting during inside work.

(28) All required tests should be made as specified and witnessed by the inspector. A complete record of each test should be maintained.

(29) Check for requirement for dike to contain leaks and spills. Insure that containment area is built to required dimensions, and that joints of dike materials are constructed to prevent leakage to adjacent areas.

(30) Check for access ramps or steps over dike wells for access to storage tanks.

(31) Check for restoration work requirement to restore area outside of dike area after construction is complete. The work will be done in accordance with contract specifications.

b. Underground Tanks

(1) Check anchoring in locations subject to high ground water.

(2) Check shop drawings. Verify foundation bolt layout check bolts for proper length and diameter.

(3) See that tanks have been constructed in accordance with applicable standards and approved shop drawings.

(4) Ensure that pressure tests are performed. Check to see if vacuum test on the interstitialspace is require to be performed.

(5) Examine tank openings and fittings for location, size, type, and reinforcing.

(6) Inspect shop applied coating on tanks. Witness holiday test of coating. Repair coating and re-test to confirm quality of repair. Check certified reports or inspection reports provided by factory for compliance with contract specifications and approved shop drawings.

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(7) Field-applied coatings on tanks.

(a) Observe removal of shop protective paint coating for conformance with specification requirements.

(b) Observe preparation and cleaning of tank surfaces to be coated.

(c) Require application of primer immediately after cleaning.

(d) Check application of enamel while primer is still "live".

(e) Determine the needs for re-priming, or for primer removal and reapplication.

(f) Check use of manufacturer's recommendations.

(g) Verify results of holiday testing and repairs to coating.

(h) Witness handling of coated tank to avoid damage.

(8) Check type of fuel resistant gaskets {Buna-N or cork}.

(9) Examine coating of tie-down straps.

(10) See that all appurtenances are installed inside of tank. See that leak detection connections are installed on dual wall tanks.

(11) Witness cleaning of interior of tank.

(12) Witness tank calibration.

(13) Observe the use of flexible connectors or piping to tanks.

(14) See that tank slopes to low point or sump.

(15) Check specification requirements for installation of cathodic protection for tank and piping to tank. See section on cathodic protection.

(16) Check specification requirements for backfilling around tank and piping. Check to see that tank manhole is to the proper elevation. Clean out manhole after backfilling tank area. Check for paved area or gravel area around manhole of tank and tank area in general.

(17) Check to see that tank vent is installed to correct height and installed as shown on drawings.

(18) Check to see that fill line to tank is to given grade and protected from damage.

13D-03 PUMPS (Excluding water pumps)

a. General

(1) Determine that certified test curves are furnished for each type of pump. Determine that shop drawings are approved.

(2) See that operation, maintenance, and installation instructions are furnished.

(3) Note type of bearings. Check type of seal. Determine lubrication requirement and water cooling requirement.

(4) Verify adjustment of stuffing box glands and leakage of seals.

(5) Observe the direction of rotation.

(6) Pumps to motor alignment can be thrown out of allowable tolerance at couplings during bolting down of base plate or attaching pipe to the pump. Check coupling alignment after pump is set and piping is attached. If coupling is out of tolerance, the motor should be reset to eliminate the out of tolerance measurements at the coupling.

(7) Examine guard device over couplings.

(8) Note electric motor drivers under operations.

b. Positive Displacement Pump

Check by-pass or leak-off protection in the event of a closed discharge.

c. Centrifugal Pump

(1) Check type of casing and material.

(2) Check inherent self-priming features.

(3) Check facilities on top of casings.

d. Deep Well Turbine Pump

(1) Obtain and record the impeller clearance settings as made by the pump manufacturer's service engineer.

(2) Check pumps for non-reversing ratchet or restrictor.

(3) Verify overhead clearance and openings in slab above for removal of pumps.

(4) Insure minimum submergence setting.

(5) See that vents are installed at the high point of all pumps.

(6) Note bowl serial number to assure correct assembly when field assembled. Inspect bowl alignment.

(7) Examine the check-valves installed between gate-valve and pump.

(8) Determine that pump setting is level and plumb.

13D-04 AIRCRAFT FUELING SYSTEM

a. General

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(1) Insure provisions to avoid injury and damage to work in the proximity of hangars, parking aprons, and runways.

(2) Follow coordination between contractor and the air base.

(3) Avoid substitution for approved materials. Require all materials be submitted for approval.

(4) See that every effort is made to furnish an uncontaminated system.

(5) Check cleanliness of existing system prior to connecting a new installation.

(6) Evaluate effect of welding operations on existing system prior to commencement of work because of the extreme hazard involved.

(7) Inspect painted identification marking of fuel system.

b. Fuel piping

(1) Determine size, material, thickness, coating, and painting of pipe.

(2) Refer to chapter for Welding.

(3) Examine storage of piping and materials to prevent contamination.

(4) Check blanking ends of piping.

(5) Check for anchoring and expansion provisions.

(6) Require pneumatic testing with dry air.

(7) Inspect painted identification marking of fuel system.

(8) Note installation of valve numbering system.

(9) Require gasket material that is suitable for use with petroleum products.

(10) Observe types of pipe sleeves for pipe passing through concrete or masonry construction.

(11) Witness holiday tests of pipe coating.

(12) Compare pipe joint compound with type of product approved.

(13) Check to make sure that there are pressure relief valves or other means included to provide pressure relief between closed valves.

(14) Examine encasement or protective sleeves where lines pass under structures, railroad tracks and paved areas.

(15) Assure that the fittings and tools used for coupling hose to track or railway cars are non-sparking materials.

(16) Determine that fill connections are identified to indicate the type of fuel handled.

(17) Inspect the slope or pitch of the pipe.

(18) Look at low spots for drains and at high points for air releases.

(19) See that unloading couplings are below tank car or truck unloading connections.

c. Valves

(1) Check to determine lubrication or non-lubrication.

(2) Check type of material and pressure rating.

(3) Check valve boxes and extensions.

(4) Check for special valves.

(5) Check timing for POL Valves and sequence of operation.

d. Strainers

(1) Check for proper mesh size and non-corrosive basket construction.

(2) Strainers should not be placed in line before pig* is blown through lines and line has been blown clean.

(3) Strainers should be cleaned prior to acceptance from the contractor.

e. Gauges

(1) Inspect to see that scale range is as per contract requirement.

(2) Inspect size and construction.

(3) Inspect tank gauge and pump control.

(4) Inspect to see that loss liquid level pump control is set at same level as minimum submergence level of pump.

f. Filter Separators

(1) Check to see that filter separator has been approved.

(2) Examine type of filtering media for approval.

(3) Insure filtering media replacement after operations and tests.

(4) Insure that equipment is installed so that no dismantling is necessary to replace filtering media cartridge or strainers.

(5) Check requirement for spare filter media cartridges. Turn spares over to using agency at end of contract.

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(6) Check water dump valve operations by slugging the filter with water.

(7) Secure, review, and maintain custody of the results of all tests performed.

g. Mechanical Equipment

(1) Check insulated joint on railroad track.

(2) Check covers of hydrant outlet pits for good balance and fit.

h. Operations and Testing

(1) Verify availability, in sufficient quantity of each product.

(2) Check cleanliness of products delivered from existing facilities for entry into the new system.

(3) Check use of the Government furnished tank trucks, meters, hoses, filter media, hose, cart, etc.

(4) Do not permit intermixing of fuel, in a dual fuel installation. Check requirement for a set of testing equipment for each fuel system.

(5) Require test reports and certification that system cleanliness standards have been met prior to turn over of a facility to the using agency.

(6) Witness all testing and see that a test data log is prepared by the contractor. A copy of this test data should be included in the job files.

13D-05 SEWAGE TREATMENT PLANTS

a. Sewage Bar Screens and Shredder

(1) See that bars are parallel to one another, equally spaced, and in the same place of travel as the rakes.

(2) Observe the adjustment of teeth on rakes for proper mating with screen along entire travel. Reject rakes with damaged teeth.

(3) Determine that manufacturer*s representative adjusts tension of sprocket chains.

(4) Notice rake wiper for efficient cleaning of rakes.

(5) Examine shock absorber for elimination of excessive wiper shock and smooth operation.

(6) See that complete assembly is set in concrete so that no water is bypassed between concrete and equipment.

(7) Require contractor to furnish competent engineer to instruct government representatives in operations and maintenance.

(8) Witness operational tests for equipment performance required by specifications.

(9) Obtain special tools, if required.

b. Grit Chamber

(1) Check elevator and level of proportional weir.

(2) Check rake travel to see that it is parallel with floor of chamber.

(3) Check rake clearance for agreement with approved shop drawings.

(4) Check sprocket chain tension and adjusting mechanism.

(5) Conduct operational test as required.

c. Settling Chambers (Sedimentation Tanks)

(1) Rectangular and circular sedimentation tanks.

(a) Assure that all embedded items are installed and are properly located.

(b) Examine elevation of concrete baffles and scum troughs.

(c) Observe and record all recommendations and settings made by manufacturer*s representative supervising installation of equipment.

(d) Evaluate adjustable weirs for elevation, level and range of travel.

(a) Note adjusting mechanism of chain drive for easy operation and for sufficient range to procure proper tension in chain.

(f) Inspect scum pipes for level and elevation.

(g) Require lubrication with recommended lubricants prior to initial start-up.

(h) View sprocket-wheel bearings for cleanliness, freedom from binding, and smoothness of bearing surface.

(i) Check sprocket teeth for defects and for meshing accurately with chain.

(j) See that shafting is level, plumb, and free from rotation.

(k) Check chain for damaged links.

(2) Rectangular Sedimentation Tanks.

(a) Examine skimming run supports for level.

(b) See that angle track is level and aligned with forward sprocket.

(3) Circular Sedimentation Tanks.

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(a) Observe whether top of tank is level.

(b) Inspect skimmer arm, blade, and receptacle for rigid support and assembly. Verify blade clearance.

d. Dosing Chamber

(1) Check weirs for proper elevation.

(2) Check all siphon placement dimensions and position.

(3) Observe adjustment and operation of weir plates or stop planks.

(4) Verify location of trap opening pipe so that sewage does not discharge directly into it.

(5) Observe setting of bell with respect to top of main trap pipe.

(6) Assure that invert of vent and overflow pipe is above the maximum discharge level of the siphon.

(7) During preliminary testing of tank, check maximum and minimum discharge levels and the level at which the siphon stops operating (minimum drawdown level)

(8) Conduct operating tests as required.

(9) Contractor must furnish competent engineer, or superintendent, as necessary, to provide proper installation and adjustments, to conduct tests, and to instruct government representatives in proper operation.

e. Trickling Filter

(1) Check filter media for size and specified material.

(2) Insure that media material is protected from contamination is stockpiled prior to placement in filter.

(3) Reject filter media that has been contaminated with nonremovable materials such as oils, grease, soil, etc.

(4) Check placing of filter material.

(5) Assure against contamination after finished placement of filter media.

(6) Check underdrains, for uniform bearing over the entire bottom of each block. See that cross joints are staggered in adjacent rows.

(7) Check air ducts for blockages.

(8) Check that blocks in drainage channel are not moved by placement of filter media.

f. Distributors

(1) Fixed Nozzle.

(a) Check stability and caulking in joint of piping laid within filter.

(b) Note spray nozzles for effective and uniform distribution of sewage over entire filter bed.

(c) Assure furnishing of spare nozzles.

(d) Perform operating tests as required.

(2) Rotary.

(a) Assure uniform distribution of sewage over entire filter bed.

(b) Examine distribution arm flushing valve for tightness and freedom of operation.

(c) Replace nozzles that do not show uniform flow characteristics.

(d) Assure that distribution arms are level guyed.

(e) Inspect seal for operation and tightness.

(f) Witness operation of arms at minimum head for starting and for operation. Complete cycle through all heads to maximum. See that motion of arms is parallel to surface of media.

g. Sludge Digester

1) Check all embedded items for proper location.

(2) Evaluate all cover seals for gas tightness.

(3) Check overall inside diameter of tank of floating cover digesters for roundness and clearances.

(4) Examine cover rollers for clean bearings, ease of greasing operations, and alignment of rollers and guides.

(5) Inspect heating system piping for tightness, materials, and secure fastening.

(6) Assure that elevation of all cover rests are the same on floating cover digesters.

(7) Check sludge draw-off piping for location of rigid support.

(8) Assure that all heating system lines, gas lines, feed pipes, and supernatant lines are flushed prior to operation.

(9) Assure that all debris is cleaned from interior of structure.

(10) Check center post installation for plumbness and rigidity.

(11) Examine sludge mixes and scum breaker for operating ease and settings.

(12) Witness and record tests and adjustments made by manufacturer*s representatives.

(13) Refer to Chapter 5B for welding.

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(14) See that all manholes and openings through covers are gas-tight.

(15) Note all sensing locations for thermometers and controls.

(16) Verify that speed of mixer is set by manufacturer*s representative or contractor.

(17) Observe setting of gas pressure regulating valve.

(18) Check the use of flexible hose with double unions, in cold water connection to heating system.

(19) Obtain any special tools required.

(20) Perform operating tests as required.

(21) Require contractor to furnish competent engineer for instructional purposes.

13D-06 WATER DISTRIBUTION

a. Pumps

(1) Be familiar with all pump manufacturer*s recommendations and with Hydraulic Institute*s standards. Assure that installation is in accordance with same.

(2) Assure that adequate foundation is provided.

(3) Verify the use of a direct drive pump when such is specified.

(4) See that pump can be dismantled without disturbing pipe connection or the alignment of pump.

(5) Assure that bronze parts are used where specified.

(6) Check freedom of movement of impeller and shaft.

(7) Assure that water-seal is provided with proper type and size of packing.

(8) Inspect for necessary air cocks, drain plugs, gauges, and relief valves.

(9) Determine whether a gasoline engine is specified. Check out same. (Use check list for Generator Units, included in this chapter).

(10) Check controls to see that they function as specified.

(11) Assure that all gears, couplings, projecting set screws, keys, and other rotating or reciprocating parts are fully enclosed or properly guarded.

(12) Assure that all instruction books, tools, and pumps characteristic curves have been obtained from contractor.

(13) Examine Hydraulic Institute*s standard and NEPA Standard N5.20 or American Standard B58.1. See that tests are made in accordance with these requirements.

b. Water Tanks and Stand Pipes

(1) Check foundation construction against plans, specifications, and shop drawings. Be sure to compare approved shop drawings for foundation with fabricated column base plates and anchor bolt layout.

(2) Closely compare steel erection with approved shop drawings. Check the erection of steel with Chapter 5A Structural steel and Chapter 5B Welding.

(3) Examine the layout of valve chamber to see that there is adequate room for later maintenance of all parts.

(4) Make sure all required checks, gates, altitude valves, and pressure guages are installed.

(5) Affirm that the results of the hydrostatic test are satisfactory.

(6) Check the installation of such items as cathodic protection, lighting and grounding.

(7) Determine whether there is a complete shop coat coverage and that the tank receives the specified finish paint.

(8) Determine the PPM of chlorine in the system during and after the disinfection period. Prior to chlorination, internal brass parts, such as those in altitude valves, should be removed and later replaced after the chlorine has been flushed from the line.

c. Chlorine and Hypochlorite Feeding Machines

(1) Work to be performed in accordance with the manufacturer's recommendations, and to conform with plans and specifications.

(2) Assure the workmen are skilled in this type of work.

(3) See that controls, gauges, meters, valves, injectors, and reliefs are installed as required.

(4) Check for proper piping installation. Know where emergency shut off valves are located on the chlorine supply lines and tanks.

(5) Make sure that all special tools, operating instructions, and manuals are provided.

(6) Perform operational tests as required.

13D-07 GENERATING UNITS

a. See that contractor has verified all dimensions.

b. See Chapter 15A for checking pipe and fittings, Chapter 16A for electrical features, and Chapter 5B for welding.

c. Determine that skilled workmen are being employed.

d. Assure easy access to all parts of the engine.

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e. Examine fuel handling and storage facilities.

(1) Observe tank installation.

(2) Check manhole construction; observe for water-tight cover, and for the height of manhole cover.

f. Assure necessary access doors in equipment.

g. Check the water level.

h. Check for excessive vibration.

i. Observe adjustment of V belt drives.

j. When operating the engine, check for excessive smoke, overheating, etc. at this time also check to insure that adequate ventilation is present in the test areas.

k. Check day tank installation.

(1) Check mounting and method of supporting.

(2) Determine that high level cutoff switch is properly installed.

l. Assure that approved tanks are installed as specified.

(1) Assure that tanks are kept clean during installation.

(2) Check cleaning operation and its results.

(3) Examine priming and painting applications.

(4) Holiday test the tanks as necessary to assure a complete prime and paint job.

(5) Check voltage of holiday detector.

(6) Continually watch for abrasions.

(7) Carefully watch backfill operation, check compaction and watch for any possible damage to tank or piping.

(8) See that all bare places on exterior of tank are repaired with hot enamel.

m. Check the installation, anchorage, and support of all piping. This includes the exhaust piping and muffler.

n. Make sure that all pipes, valves, fittings, pumps, etc., for the fuel and lubricant systems are shipped to the job with ends closed. Check when installed to assure cleanliness, and continue to guard against the entrance of dirt and foreign matter into the equipment.

o. Assure the acid cleaning, the neutralization, and the drying of the interior of the fuel piping systems.

p. Note the requirement for expansion joints.

(1) Check type furnished.

(2) Check method of installation.

(3) Check for misalignments.

(4) Follow manufacturer*s instructions to determine range of movement for installing expansion joints.

q. Mufflers.

(1) Check type furnished and specified.

(2) Check method of mounting.

(3) Check treatment for rust resistance.

(4) Check noise level.

(5) Check drain hole.

r. Be alert for the requirements concerning auxiliary equipment such as silencer, special controls, trickle charges, filters, instrument board, static exciter, voltage regulator, auxiliary compartment, special tools, operating instructions and manuals.

s. See that required tests are made.

(1) Check safety circuit.

(2) Check governor.

(3) Check fly wheel.

(4) Check accessibility of brush rigging.

(5) Performance.

(6) Controls and interlocks.

13D-08 INCINERATORS

a. Make sure that construction is in exact accordance with approved shop drawings. Check dimensions very carefully.

b. Check construction and thickness of fire brick in furnace and flue connections. Watch for:

(1) Width of joints.

(2) Wall thickness.

(3) Handle of arches and circular linings.

(4) Size of baffle.

(5) Bricks laid on edge in hearths and floors.

(6) Installation of expansion joints.

(7) Bracing.

c. Check casting and bonding of refractory casting when same is used.

d. See that insulating brick is installed in specific location.

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e. See Chapter 4 for Installation of exterior wall brick.

f. Assure that there is at least a 2" separation between exterior walls and fire brick lining of chimney. Check plans and specifications to see if different dimension is required for the separation for your specific contract.

g. Check chimney for:

- (1) Cleanout door and frame.
- (2) Concrete protective cap.
- (3) Spark screen.

h. Assure the installation of a safety rail around charging throats and guillotine.

i. Check the installation for items such as:

- (1) Dampers.
- (2) Auxiliary burners.
- (3) Test pipes.
- (4) Instruments.

j. Determine if other equipment such as can-wash or forced-draft is specified and check same.

k. Require that all necessary operating tools; spare parts, operating instructions, manuals, and training have been provided.

l. See that unit is dried out in accordance with requirements.

m. Assure that operating tests are conducted and that results have been recorded. Obtain copies of all test records and certification that unit was properly constructed and is operating satisfactorily.

13D-09 FOOD SERVICE AND HOSPITAL EQUIPMENT

a. Require an equipment layout if there is any question of items fitting into place.

b. Require the installation of all trimmings, steam traps and fittings necessary for proper operation.

c. See that the equipment manufacturer's name plate is in a conspicuous location.

d. Install back flow preventers when equipment has a water supply.

e. Determine that motors of equipment are suitable for voltage supplied.

f. Check the quality of workmanship in the fabricated equipment.

g. Check welds for smooth, ground off finish, and ensure freedom from imperfections and color differences.

h. Check for the substitution of spot welds where full welds are needed or specified.

i. Check the type of material used in fabrication and the type and quality of finish.

j. Check for burrs, projections, and fins.

k. Inspect for exposed screws, rivets, or bolt heads.

l. Check for ferrous fastenings where stainless types are specified.

m. All exposed piping is to be chromium-plated brass.

n. Completely check out the plumbing for equipment, using Chapter 15.

o. Check all dimensions and capacities of equipment.

p. Check equipment for specified controls.

q. Input for any breaks in coated metal, and make sure the metal is properly treated and protected against corrosion.

r. Determine that equipment with waste or drain surfaces is pitched to drain,

a. Inspect counter tops for:

(1) Defects.

(2) Corners being rounded, bullnosed, and equal in finish of the counter top.

(3) Closure at walls.

(4) Bracing.

t. Compare all gauges of metals with gauges approved on shop drawings.

u. Determine that all equipment is easy to clean.

v. Check equipment drawers for corrosion-resisting steel sides, roller bearings, and the amount of play.

w. Check size of drawer to see that they have the specified stop.

x. Check sliding doors for construction, size, type, and ease of operation.

y. Check all hardware for type of material and finish.

z. Inspect sinks for:

(1) Specified fixtures and trim.

(2) Overflow fittings.

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(3) Special features required.

aa. Examine all hoods for:

(1) Corrosion resisting steel construction.

(2) Freedom from vibration.

(3) Method of hanging.

(4) Grease filters.

(5) Method of connecting to duct.

ab. Determine that each piece of equipment is continually protected and that it is cleaned prior to turn over to the using agency.

ac. Require an instruction book with each piece of equipment.

ad. Require special tools be furnished, if specified.

ae. Require operational tests for each piece of equipment. Make a record of your findings.

af. When specified, assure that an experienced engineer from the manufacturer's plant is present to supervise the equipment installation and testing.